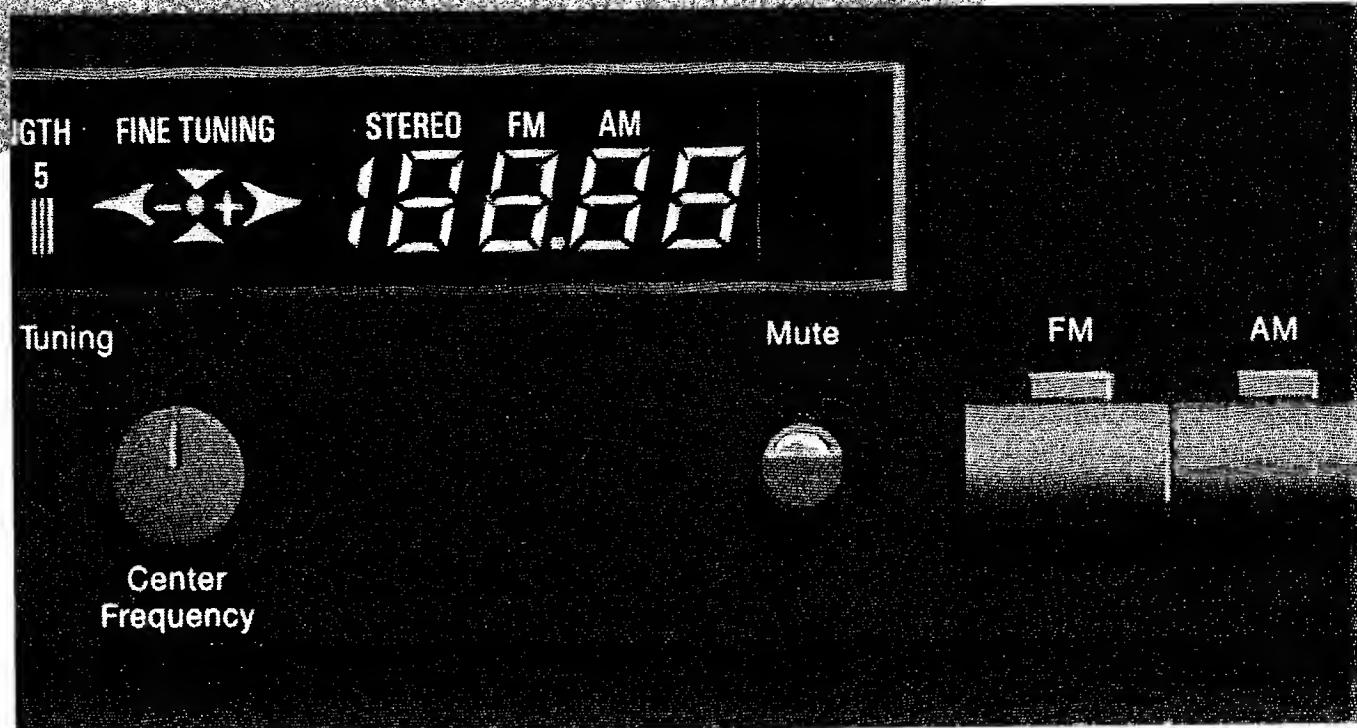


# I<sup>II</sup>citation

harman/kardon

twenty - three



*Active Tracking Tuner Instruction Manual*

## R e a r   P a n e l   S a f e t y   P r e c a u t i o n s



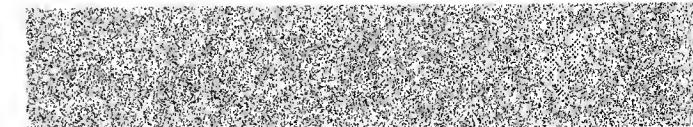
CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure, that may be of sufficient magnitude to constitute a risk of electrical shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions within the literature accompanying the component.



1. Read instructions—all safety and operation instructions should be read before using the tuner .
2. Retain instructions for future reference.
3. Heed warnings—all warnings on the tuner and in its operations instructions should be adhered to.
4. Follow all instructions.
5. Water and moisture—do not use the tuner around water, for example near a swimming pool, sink or in a wet basement.
6. Ventilation—The tuner should be situated so that its location or position does not interfere with its proper ventilation.

7. Heat—The tuner should be situated away from heat sources such as radiators, fireplaces, stoves, electric popcorn poppers or other appliances that produce heat. Also avoid prolonged contact with direct sunlight and extremely low temperatures.
8. Power sources—The tuner should be connected ONLY to a power supply of 120 volts, 60 cycles.
9. Power cord protection—Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles and the point at which the cord exits from the tuner. Also never pull or stretch the cord.
10. Cleaning—Do not use volatile solvents such as alcohol, gasoline, benzine etc. to clean the tuner cabinet. Use only a clean dry cloth. If you must use a wet cloth, wet only the cloth lightly with water.

11. Object and liquid entry—Care should be taken so that objects (including excessive dust) do not fall into the unit, and that liquids are not spilled into the inside of the tuner.
12. Abnormal smells—if an abnormal smell or smoke is detected, immediately turn the tuner power OFF and pull out the power cord. Contact your dealer or nearest Harman Kardon Service station.
13. Damage requiring service—The tuner should be serviced by qualified service personnel when:
  - A. The power supply cord or the plug have been damaged; or
  - B. Objects have fallen, or liquid has been spilled into the tuner; or
  - C. The tuner has been exposed to rain; or
  - D. The tuner does not appear to operate normally in performance; or
  - E. The tuner has been dropped or the cabinet damaged.

14. Servicing—The user should not attempt to service the tuner beyond those means described in this manual. All other servicing should be referred to qualified service personnel.

**IMPORTANT SAFETY PRECAUTION FOR AC PLUG**

**CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT USE THE CITATION 23's POLARIZED PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.**

**BRANCHEMENT DE LA FICHE SECTEUR**

**ATTENTION: POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR. UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.**

# **I n t r o d u c t i o n**

## *Important Design Features of Citation 23 Active Tracking Tuner*

Thank you for choosing Citation.

Judging from your choice of tuners, you are a discriminating listener. You now own a superb piece of high fidelity equipment. Used properly, you are about to begin thousands of hours of broadcast reception enjoyment.

While you are probably no beginner when it comes to high fidelity components, we nevertheless ask you to read and carefully follow the instructions in this manual to insure a successful partnership between you and your new Citation Tuner.

Actual hook-up instructions begin on page 6.

### ***Unique Active Circuitry to Increase Adjacent FM Selectivity***

Many current tuner designs use what amounts to extremely sharp bandpass filters to isolate a desired broadcast band. The unfortunate side effect of this approach to achieving high selectivity occurs due to the inherent phase and amplitude inaccuracies of filters.

Your Citation 23 employs a radical new solution that eliminates the need for filtering, while also improving overall sound quality. Harman Kardon engineers approached the problem of rejecting adjacent FM bands by designing active circuitry that works from the *center* of the FM band, instead of filtering the *outsides*. A Phase Locked Loop configuration literally locks onto the FM carrier, isolating the central carrier frequency of the desired listening band and then determining the precise modulation deviation caused by the music signal during broadcasting.

By limiting the PLL's tracking range to just slightly more than that of the modulation, only the signal necessary for good separation and low distortion is "read." Phase-distorting filters are unnecessary. Yet adjacent channel selectivity is excellent. And, because the Phase Locked Loop circuit does not employ resonant or "tuned" elements, it doesn't inherently shift the phase of the signal as conventional designs often do. Both stereo musical information and the 19kHz pilot frequency remain "phase intact." Total Harmonic Distortion and stereo separation attain levels which will please even the most critical listener.

### ***Analog Fine Tuning***

Other digital synthesized tuner designs give you no latitude in tuning the center of an FM band. They stubbornly lock onto the theoretical center point and, at best, allow "wide" or "narrow" filtering. The Citation 23 has a unique fine tuning circuit that allows you to further increase adjacent station rejection and thereby eliminate interference. With it, you can actually tune slightly away as much as 25kHz from the assigned frequency center to avoid a strong adjacent channel. This can add another 20dB of rejection.

### ***Adjustable Muting Level***

The Citation 23 allows you to adjust the muting threshold to suit your own reception area and listening habits.

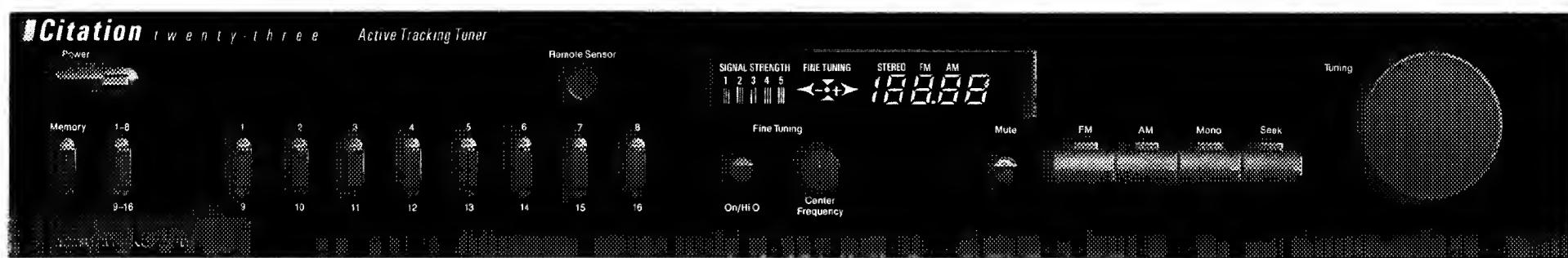


Figure 1 Citation 23 Front Panel

The following is a short explanation of the operating controls and features on the front panel of your Citation 23 Active Tracking FM/AM Tuner.

Beginning on the far left hand side is the **Power** button with a built-in LED indicator. While you can turn on the Citation 23 using the remote control, the Power button on the front panel must be ON first.

Beneath it is the **Memory** switch which is used to memorize station presets. When pressed, a light at either end of the control will flash for eight seconds, during which a preset selection is made. Full instructions on memorizing presets are in the **OPERATION** section of this manual.

Next to Memory is a preset bank selector button marked **1-8** and **9-16**. The Citation 23 allows you to preset sixteen random FM and AM stations using just eight preset recall buttons. By pressing this button, the bank of station pre-

set buttons are switched from presets 1 through 8 to presets 9 through 16. Pressing it again returns to presets 1-8. In each case, the appropriate end of the preset selector button will light up.

Each of the actual preset buttons is numbered at each end and can be used to recall two stations. You do not need to use all of the presets; and AM and FM stations may be mixed in any order.

The **Fine Tuning** section of the Citation 23 is a unique feature which will allow you to better receive stations which may otherwise be obliterated by strong adjacent signals. Under good reception conditions, the tuner is operated in the normal mode with the **Fine Tuning** feature inoperative. When a strong adjacent station interferes with reception the **Fine Tuning** and **Hi Q** features should be activated by pressing the **On/Hi Q** button. This "unlocks" the digital synthesized tuning circuitry and switches the tuner to a super-narrow bandwidth mode, allowing manual adjustment of the **Center Frequency** knob. This is discussed farther on in this manual under **OPERATION**.

Above the **Fine Tuning** adjustments is the Citation 23's LCD display panel. Five meter segments are used to indicate **SIGNAL STRENGTH**. Next is the **FINE TUNING** indicator, which is used as a visual display of Fine Tuning adjustments. Above the 5-digit frequency display are three status LED'S which indicate the presence of an FM **STEREO** carrier, and whether you are listening to **FM** or **AM**.

Below the digital display is the **Mute** button. When pressed, it cuts all audio output between stations, and when especially weak stations are encountered. If you wish to use the Citation 23's **Fine Tuning** controls to improve the reception of very weak stations, make sure that this button is off when you begin your adjustments.

The **FM** and **AM** buttons are used to select the appropriate broadcast band when manually tuning or when setting presets. Once a station preset has been committed to the Citation 23's memory, the tuner will switch automatically to AM or FM.

## Citation 23 Tuner Remote Control

The Mono switch is especially useful when listening to FM stations which are prone to some types of noise and distortion. The FM broadcast signal is actually comprised of two parts, a Left + Right channel mono signal and a Left - Right signal which carries stereo information (this is what is sensed when the STEREO light comes on). Unfortunately, the L-R signal is very delicate and more susceptible to interference. When the L-R signal is interfered with, the result is intermittent bursts of disturbing noises, often referred to as "picket-fencing." Engaging the Citation 23's Mono button will remove the L-R signal and deliver only the more stable mono signal.

The Seek button is used in conjunction with the large rotary Tuning knob to its right. When Seek is engaged, rotating the Tuning knob in either direction causes the Citation 23's tuning circuits to scan across the broadcast band "seeking" (and stopping) at the next strong signal. When Seek is not on, the Tuning control is in manual mode. This allows you to locate weak or adjacent stations which might be skipped over while in the Seek mode. Turning the Tuning knob to the right moves "up" the FM or AM broadcast band; left tunes "down." When you reach the top or bottom limit of either band, further rotation in that direction will have no effect and you must begin turning the Tuning knob the other way. In the Seek mode, the scanning circuit will automatically reverse its scanning direction when it reaches either end of the tuning band.

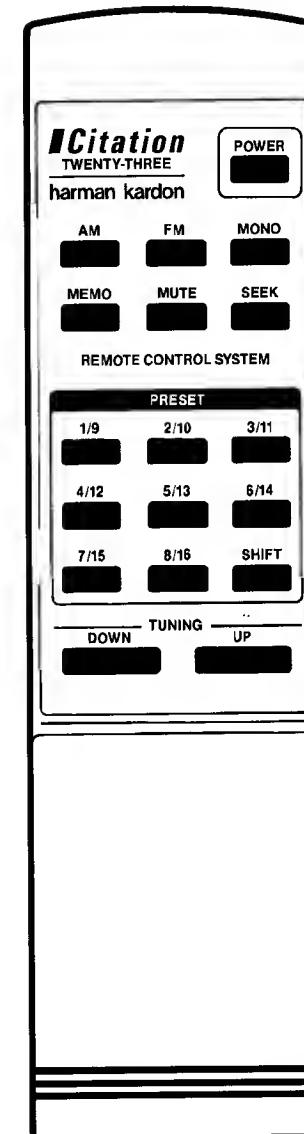
Your tuner is equipped with a hand-held wireless remote control unit which duplicates most of the features on the Citation 23 front panel.

The remote's POWER button turns the tuner on and off, after you have first turned it on with the front panel switch. Thereafter, the front panel Power switch should be left on, when using the remote.

The remote control MEMO button corresponds to the Memory button on the Citation 23 front panel.

The SHIFT button duplicates the functions of the 1-8/9-16 switch on the tuner's front panel. Pressing it repeatedly cycles between presets 1-8 and 9-16.

DOWN and UP work in conjunction with the SEEK button and represent left and right rotation of the front panel Tuning knob.



## Packing and Paperwork

Save all packing material from your Citation 23 Tuner. While the box is quite large and may be a nuisance to store, it is essential for shipping if you move or should the unit ever need repair.

Also be sure to fill out the warranty card and save your sales receipt in a safe place. It is necessary to establish the date on which your warranty begins, and as proof of ownership in the event of something drastic such as fire or theft.

## Placement

The Citation 23 is fully shielded and may be placed on top of or under other stereo components, provided that its 3/8-inch "feet" provide sufficient clearance for the cooling needs of the component below. Make sure that it is in a "line of sight" position no more than 30 degrees off-axis relative to your listening area, if you intend to use the remote control.

## Antenna Hook-Up

The Citation 23 is truly a state-of-the-art design. However, to realize its maximum potential, particularly with stereo FM stations, you need the best signal possible.

## The Role of Your Antenna

While it may seem obvious that an antenna is critical to good reception, it is often not given sufficient consideration. The results can be significantly reduced tuner performance (a classic example of "garbage in, garbage out"). The question of just how elaborate an antenna installation you need can be determined by considering the following:

1. **How good is reception in your area?**  
If you live in an area with a moderate number of strong FM and AM stations, you may not need as large an antenna as you would if you live in a rural area or an urban area with many adjacent stations.
2. **Are you interested in receiving weak or distant stations?**  
Some very interesting programming (ethnic, classical, college formats, for example) is often on stations with very low transmitting power. Or you may simply live in an area far removed from *all* stations. If so, you should consider a more elaborate antenna installation.
3. **Is separation, bandwidth and freedom from interference critical?**  
The Citation 23 is capable of extremely high fidelity reception with the right input. If you often tape broadcasts, or own a system where you can hear critical differences in broadcast quality, investing in a better antenna can increase the overall fidelity of many stations.
4. **Does your living environment allow a large antenna, either indoor or outdoor?**  
Sometimes space, physical layout (such as living in an apartment house) or even city ordinances can affect your decision in this respect.

5. **Do you have access to FM through a TV cable system?**  
The benefits of using commercial cable as a high quality FM source are many and you should investigate this option if it is available.

In general, the higher the antenna, the better it will perform. Radio waves travel in straight lines from the transmitter and if your antenna is free and clear of obstructions, it will perform better and you will enjoy greater signal strength.

## Indoor FM Antennas

An indoor antenna, such as the one included with the Citation 23 will work well if you enjoy good "line of sight" with the area's FM transmitters or live in the upper stories of a building. Remember, however, that indoor antennas cannot provide height and may be prone to receiving interference from cars on the street or small appliances in the kitchen.

If you are satisfied with the performance of an indoor antenna (or are limited in this respect), your first choice is the half-wave dipole antenna included with the Citation 23. It will work well in many situations and can be used until you decide whether or not you need a more extensive antenna system. Because it is basically bi-directional, it may be prone to interference or may limit your ability to "fine tune" certain stations that are not on its axis.

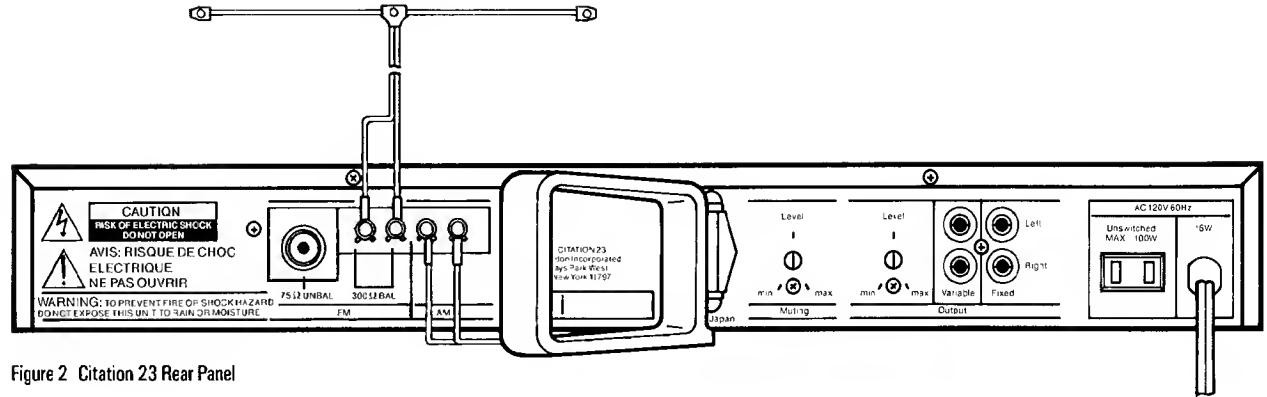


Figure 2 Citation 23 Rear Panel

The next choice is a pair of "rabbit ears" like the ones often used with television sets. While they have some of the same drawbacks as a flexible dipole, "rabbit ears" are easier to manually adjust for a given station. Make sure that they are not equipped with an FM trap, which would remove the FM signal from TV stations received.

The best possible indoor antenna is a table top model specially designed for FM reception. There are many brands on the market including some powered designs and models with manual fine-tuning adjustments. Check with your Harman Kardon dealer for advice on which is most appropriate for your needs and budget.

### Outdoor FM Antennas

Properly set up, an outdoor FM antenna can provide significantly better reception than any indoor design. Options range from simple, omni-directional dipoles to elaborate directional designs with rotators that can give you the best possible reception of any given station. If you are plagued by severe localized noise and multipath interference, you should consider a directional Yagi-style antenna if possible. Consult with your Harman Kardon dealer or with a local radio/television supply shop, since this decision must be made on the basis of your individual area. While it is not in the scope of this manual to cover actual outdoor antenna installation, remember these guidelines:

1. Make sure the antenna is properly installed with sufficient stability and proper grounding (never to a gas pipe).
2. Use a proper antenna discharge unit or lightning arrestor between the antenna and the Citation 23.
3. Avoid installing the antenna anywhere remotely close to power lines.
4. Above all, be careful, or have a reputable TV installation service erect your antenna.

## AM Antennas

The loop antenna included with your Citation 23 will work well under most circumstances. It is directional, can be easily adjusted and does an excellent job of rejecting local AM interference. If you are interested in receiving a greater number of AM stations, and are in an area where local AM interference is not a problem, consider a long wire antenna. Plans and schematics for many designs are published in books available at your library or through TV & radio supply houses.

## Feedline Considerations

Just as the cables used to connect your system contribute to its sound quality, the feedlines running from your antenna to the Citation 23 play an important part in good reception. Your tuner is equipped with inputs for unbalanced 75-ohm or 300-ohm balanced FM input. There are trade-offs for both.

300-ohm twin lead-in is inexpensive and has relatively low signal losses (1.25 dB per 100 ft. at 100MHz), but if improperly installed, can act as an antenna itself, picking up unwanted signals. It also suffers signal losses when it becomes wet. Twin lead should be routed to avoid gutters, electrical wiring, pipes and other metal objects.

75-ohm coaxial cable is more expensive and has slightly higher signal losses (3.5dB per 100 ft. at 100MHz) but is far less prone to external noise, interference and weather, due to its shielding and design. You will need to use a matching transformer at the antenna end.

## Antenna Connections

Connect your FM antenna to the appropriate Citation 23 input at the left side of the chassis back. The flexible dipole supplied with the tuner connects to the 300-ohm inputs. If you are adding an external AM antenna, connect a ground wire to the ground post on the Citation 23. (External FM antenna masts should be grounded directly from antenna to the earth ground using 10-gauge or heavier wire, stand-off insulators and a metal stake. The FM antenna should then be connected to the ground mast via an antenna discharge unit).

## Tuner Hook-Up

The Citation 23's outputs are connected to the TUNER input of your preamplifier or integrated amplifier using the hook-up cables provided.

Two output options are provided. The **Fixed** output jacks deliver a fixed line level output voltage which will generally match the line level of other components such as cassette decks or CD players. This is the most common method of connection and will work well in almost all circumstances.

However, the Citation 23 provides the added flexibility of **Variable** output, too. If the tuner output level is simply mismatched with the relative levels of other input components, use this set of outputs in conjunction with the **Level Control** just to the left of the **Variable** jacks. Instructions for adjustment are in the next section of this manual.

During hook-up, take care to match left and right component plugs with the left and right input jacks on the Citation 23. Common practice is to treat the *red* plug as right and the *grey/black/white* plug as *left*.

## Power Connection

The Citation 23 does not draw much power and may be connected to a switched or un-switched AC convenience outlet on most preamplifiers including the Citation 21.

An un-switched AC convenience outlet is also provided on the Citation 23 itself. This may be used for other components which do not draw more than 100 watts, such as cassette decks or equalizers. Under no circumstance should a power amplifier be connected to this or any other convenience outlet.

Also note that if you plug the tuner into a switched outlet on your preamplifier (which is often the most convenient power source), the Citation 23's convenience outlet will then become switched in tandem with the tuner itself.

### Setting FM and AM Presets

Being able to recall your favorite stations is an extremely convenient feature. You can mix FM and AM stations in any order on the presets. The Citation 23 will "remember" the last station preset that you were listening to and tune to that station when you turn the tuner back on. You can add or change presets any time you want.

There is no "right" or "wrong" way to use presets. Some people only set a couple of them. Others assign a station to every one. There are, however, several common approaches which you might consider. You might 1) rank stations in order of how often you listen to them, assigning Preset 1 to your most listened-to station; 2) give stations presets that correspond to their position on the AM or FM dial, with a station "low on the dial" occupying a low preset number, etc.; 3) Put all FM stations on 1-8 and all AM stations on 9-16.

1. To set a preset, first tune in the station and decide which preset number you wish to assign to it.
2. Set the 1-8/9-16 switch to the appropriate setting.
3. Now press the Memory button. It will begin flashing.
4. You have eight seconds in which to press a preset button.
5. When the Memory button stops blinking, the preset has been memorized.

This operation may also be performed with the remote control unit using the MEMO, SHIFT and preset buttons.

### Using the Remote Control

The Citation 23's remote control unit is designed to work within 20 feet of the tuner, at an angle of up to 30 degrees.

Before using it, install the two AA-size batteries included, making sure that their polarities correspond with the diagram inside the battery chamber.

Avoid spilling water on the remote unit, leaving it in intense direct sunlight or getting excessive dirt on the front infrared "projection lens."

### Using the Fine Tuning Controls

The Citation 23's Fine Tuning feature gives you unusual flexibility in eliminating strong adjacent FM signals which would normally obscure or interfere with the station you wish to receive. The center frequency knob should be used when there is a strong station on *one side or the other* of the station you wish to fine tune. Since the control, in effect, "sidesteps" the offending adjacent station by tuning away from it, it will not work when the station you wish to receive is hemmed in on both sides by other strong signals.

1. Make sure the Muting switch is out (off).
2. Tune in the station you wish to fine tune.
3. Press the On/Hi Q button. The words FINE TUNING will appear in the LCD display.
4. If interference still exists, rotate the Center Frequency knob *away* from the offending station. The movement will be represented in the FINE TUNING display.
5. When the adjacent station recedes and the station being tuned improves as much as possible, you are done.
6. After the Citation 23 is tuned to another station, the FINE TUNING mode is defeated.

### Variable Gain Adjustment

If you have chosen to use the Variable outputs on the Citation 23, its relative level should be adjusted as follows:

1. Turn on the tuner.
2. Prepare another source such as a record, cassette tape or compact disc.
3. Power up your system and play the sound source. Adjust the volume for a normal listening level.
4. Now switch the preamplifier source to TUNER.
5. On the Citation 23, press FM and Seek.
6. Using the Tuning knob, scan across the FM band, listening to the relative volume levels of various stations which you normally listen to. Pick one which represents the average reception volume level and leave the Citation 23 set on this station.
7. Now switch the preamplifier back to your original source material. Note the difference in volume levels between the record/CD/tape and the output of the tuner.
8. Rotate the Level control on the back of the Citation 23 to increase or reduce its output. Switch back and forth between reference source and the tuner regularly for comparison.
9. When the levels are equal, you are done.

## *Variable Muting Adjustment*

The best way to understand the function of the Muting button is to turn it off and manually scan the FM dial. You will hear loud interstation noise. Now press the Muting button and scan the dial again. Notice that the Citation 23 is “turning off” (muting) output between stations and “turning it back on” when a relatively strong station is encountered.

The threshold at which the muting circuitry activates has been preset for average FM station signal strengths in most American cities. However, the Citation 23 gives you the added flexibility of being able to vary the muting threshold to suit your own listening needs. If you live in an area where all stations come in relatively weakly, the tuner may simply not “un-mute” at all when it encounters a station. If you cannot improve signal strength with an antenna, the Citation 23’s muting level may be reduced. Conversely, if you reside in an area where there are literally scores of stations from overlapping cities at every point on the dial, you can increase the muting level to skip weaker/more distant stations.

There really aren’t step-by-step instructions for adjusting the rear panel muting Level control. You will simply have to experiment after thoroughly familiarizing yourself with the Muting circuit’s effect at the reference, center setting. Remember that setting it too far to the max side will exclude all but the very strongest stations, negating the use of the **Seek** tuning feature. Setting it too far to the min side will cause the **Seek** tuning feature to stop at too many weak, noisy stations.

## *Care of Your Citation 23 Tuner*

When cleaning your tuner, avoid the direct use of dusting sprays, abrasive cleaners or caustics (such as dilute ammonia window cleaning solutions). Use only a mild soap and water solution, applied to a soft cloth, rather than sprayed directly onto the component.

If the tuner begins to only intermittently respond to the remote control (or fails to activate at all), replace the AA cells in the remote.

If you are *not* using the remote, but originally put the batteries in just to see how it worked, remove them to avoid corrosion within the remote.

Once again, thank you for choosing Citation. We wish you many happy years of FM and AM listening enjoyment.

## ***Warranty and Service***

If you have followed the suggestions in this manual and are reasonably sure that your active tracking tuner requires service, call the Harman Kardon dealer from which you purchased your Citation 23. It is important that service be carried out only by a designated Harman Kardon service agent to insure both proper service and to comply with the terms of the Citation 23 Limited Warranty.

Remember to keep your sales slip or receipt in a safe place since you will be required to show it for service during the duration of the Limited Warranty.

## Citation 23 Specifications

FM SECTION	NORMAL	HIO
Usable FM Sensitivity, mono, (dBf/ $\mu$ V-75 Ohms):	10.8dBf	14.7dBf
50dB Quieting Sensitivity, mono/stereo (dBf/ $\mu$ V-75 Ohms):	15.2dBf/36.5dBf	19.1dBf/40.4dBf
FM S/N Ratio (65dBf)		
Mono:	84dB	84dB
Stereo:	75dB	75dB
Capture Ratio:	0.75dB	1.75dB
Alternate Channel Selectivity:	65dB	75dB
Adjacent Channel Selectivity:	5dB	30dB
IF Rejection:	90dB	90dB
AM Rejection, 45dBf:	70dB	70dB
Image Rejection:	75dB	85dB
Spurious Response Rejection:	115dB	115dB
THD (65dBf, 1kHz)		
Mono:	.06%	.2%
Stereo:	.08%	.2%
Stereo Separation (65dBf) 1kHz:	55dB	35dB
SCA Rejection	70dB	70dB
Audio Output Level (at 65dBf):	1.0V	1.0V
AM SECTION		
AM Sensitivity (External Antenna):	12 $\mu$ V	
AM Alternate Channel Selectivity:	60dB	
AM Image Rejection	45dB	
AM IF Rejection	65dB	
AM Signal-to-Noise Ratio:	55dB	
Dimensions:		
Width x Height x Depth:	17 $\frac{3}{8}$ " x 2 $\frac{3}{4}$ " x 14 $\frac{5}{8}$ "	
	443 x 70 x 391 mm	
Weight:	15 lbs./6.8 kg	

Feature and specification subject to change without notice.

**harman/kardon**

A Harman International Company  
240 Crossways Park West  
Woodbury, NY 11797

Printed in Japan  
All contents © 1987 Harman Kardon, Inc.